III. REMARKS

Claims 1-17 are pending in this application. By this Amendment, claim 3 has been amended. This amendment is being made to facilitate early allowance of the presently claimed subject matter. Applicant does not acquiesce in the correctness of the rejections and reserves the right to present specific arguments and/or pursue the full scope of the subject matter of the original claims in a subsequent patent application that claims priority to the instant application. Reconsideration in view of the above amendment and following remarks is respectfully requested.

In the Office Action, claim 3 is rejected under 35 U.S.C. § 112, second paragraph; claims 1-3, 8, 9, 13, and 17 are variously rejected under 35 U.S.C. §§ 102(b) and 103(a) over *Capacity Planning Model: The Important Inputs, Formulas, and Benefits* by Thomas J. Occhino (hereinafter the Occhino reference) and U.S. Patent No. 5,946,212 to Bermon *et al.*; claims 4-6, 10-12, and 14-16 are objected to as dependent upon a rejected base claim; and claim 7 is allowed.

In the Office Action, claim 3 is rejected under 35 U.S.C. § 112, second paragraph. Specifically, the Office asserts that the recitation in claim 3 that "the at least one process is a single process of the wafer start loading" is confusing when read in conjunction with the language of independent claim 1, which recites "repeating steps ii) and iii) for each process of the wafer start loading." In short, the Office asserts that steps ii) and iii) would not be repeated in the method of claim 3, since "the at least one process is a single process." Applicants respectfully traverse this rejection and believe the amendment above and the following explanation eliminate any confusion.

Claim 1 recites, in relevant part:

c) determining key shared tool set capacity by:

i) determining a capacity consumption factor for each key shared tool set used by at least one process;

ii) determining a capacity consumption of each key shared tool set used by a process of the wafer start loading;

iii) decreasing a remaining capacity value for each key shared tool set used by the process of the wafer start loading by a corresponding capacity consumption;

iv) repeating steps ii) and iii) for each process of the wafer start loading;

As filed, claim 3 reads, "The method of claim 1, wherein the at least one process is a single process of the wafer start loading, and the step of repeating further includes repeating step i) for each process of the wafer start loading."

Thus, the method of claim 3 comprises determining key shared tool set capacity for processes of the wafer start loading rather than for any process utilizing a key shared tool set, as in claim 1. Nevertheless, in order to remove potentially confusing language, Applicants have amended claim 3 to read, "The method of claim 1, wherein the at least one process is a single process of the wafer start loading." Applicants assert that, as amended, claim 3 satisfies 35 U.S.C. § 112, second paragraph, and respectfully request withdrawal of the rejection.

In the Office Action, claims 1 and 13 are rejected under 35 U.S.C. § 102(b) as being anticipated by the Occhino reference. This rejection is respectfully traversed.

First, Applicants respectfully assert that the Office is misinterpreting the "Capacity calculation" on page 455 of the Occhino reference. The calculation described does not "determin[e] a common tool set capacity by dividing wafer starts that use common non-key shared tool sets by an overall capacity parameter." Rather, the calculation estimates the planned

capacity of a tool by multiplying its throughput (in wafers per hour), its percent utilization, its percent availability, and the number of hours in the period of interest. Thus, the capacity of the tool set of the Occhino reference is measured in terms of the operation of the tool set itself, rather than its relation to an overall capacity parameter.

Second, Applicants respectfully assert that the Office is misinterpreting the "tool availability and tool utilization calculations" on page 456 of the Occhino reference. Applicants initially point out that the Occhino reference explicitly states that tool utilization is treated as a constant and is not a calculated value. "Of the four inputs mentioned as capacity calculation inputs, two are constant (hours per week and tool utilization) and two are calculated (tool availability and process throughput). Although tool utilization is not constant, for planning purposes it should be." Occhino at p. 456.

With respect to calculations of tool availability, page 456 of the Occhino reference reads:

> To obtain the tool set availability percent, the equipment engineer uses factors such as mean time between cleans (MTBC), mean time between failures (MTBF), frequency and length of scheduled maintenance events, and past performance (to estimate unscheduled maintenance events). The scheduled tool qualification time and scheduled process engineering time must also be taken into consideration. After considering all these factors a tool set availability percent can be provided to the Capacity Planner for use in the capacity calculations.

Thus, the portion of the Occhino reference cited by the Office deals simply with a method for calculating the capacity of a particular tool by taking into consideration known or predicted periods of inoperability. The passage neither discloses nor suggests "determining key shared tool set capacity by: i) determining a capacity comsumption factor for each key shared tool set used by at least one process; ii) determining a capacity consumption of each key shared tool set used by a process of the wafer start loading; iii) decreasing a remaining capacity value for each key shared tool set used by the process of the wafer start loading by a corresponding capacity

consumption; iv) repeating steps ii) and iii) for each process of the wafer start loading," as recited in claim 1 (and in claim 13 using analogous language).

Third, Applicants respectfully assert that the Office is misinterpreting the maximum capacity calculation on page 457 of the Occhino reference. That calculation (maximum capacity = total wafer starts / total tool need × total number of tools in the tool set) is simply a measure of the capacity of available tools. It does not "determin[e] the amount of wafer start capacity available for each process by dividing each remaining capacity value by a corresponding capacity consumption factor for a corresponding process," as recited in claims 1 and 13.

The calculation of the invention at issue here is quite different. It determines the overall capacity of the fabrication process by dividing the capacity of each key shared tool set (KSTS) by a capacity consumption factor (CCF). "CCF is defined as the capacity of a KSTS consumed by one wafer start of a particular process. In other words, CCF characterizes the capacity of a KSTS for each FEOL or BEOL process by indicating how much capacity a technology consumes of a KSTS for a single wafer start. Hence, CCF varies with tool set and corresponding FEOL or BEOL process." Application at ¶ 42. "CCF = number of passes × safety factor × (KSTS weighted average throughput / process throughput)" *Id.* at ¶ 43. Thus, it is clear that the maximum capacity calculation of Occhino and the wafer start capacity calculation of the present invention measure entirely different things. The former determines the capacity of a particular tool set by considering wafer starts, tool need, and available tools. The latter determines the capacity of a fabrication process by considering the capacity of each key shared tool set, the number of passes through each key shared tool set required by a particular process, a safety factor, the weighted average throughput of the key shared tool set, and the throughput of the overall process.

Finally, Applicants assert that the method described in the Occhino reference, rather than determining fabricator capacity through the simultaneous analysis of distinct tool set capacities (*i.e.*, common tool set capacity, technology capacity, and key shared tool set capacity) as in the present invention, merely describes a method for determining the capacity of an individual tool or tool set. For example, Fig. 2 on page 457 of the Occhino reference shows a table containing all of the calculations to be made using the Occhino method. What Fig. 2 shows, however, is the capacity values for only one tool set, specifically, a group of three gate etch tools. Simply put, the Occhino method permits the calculation of a capacity value for a particular tool set within a fabrication process. The method of the present invention, on the other hand, permits the calculation of the overall capacity of a fabrication process by calculating the capacities of each tool set within the process, and provides specific methods of calculating such capacities, depending on whether a particular tool set is a common tool set, a tool set unique to a particular technology, or a key shared tool set. For each of the reasons above, Applicants respectfully request withdrawal of the rejection of claims 1 and 13.

In the Office Action, claim 2 is rejected under 35 U.S.C. § 102(b) as being anticipated by the Occhino reference. Specifically, the Office asserts that "the at least one process includes every process of the fabricator" is anticipated by "the 'overall' capacity of the fabricator system as is calculated in Occhino. This rejection is respectfully traversed. Applicants note that the Occhino reference does not describe the calculation of an "overall" capacity of the fabricator system. Applicants assume that the "overall" capacity calculation referred to by the Office is the maximum capacity calculation shown on page 457 of the Occhino reference. As shown above, however, this calculation describes the capacity of a particular tool rather than the capacity of a

fabrication process. Accordingly, Applicants respectfully request withdrawal of the rejection of claim 2.

In the Office Action, claims 8 and 17 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,946,212 to Bermon *et al.* This rejection is respectfully traversed.

First, Applicants respectfully assert that the Office is misinterpreting the method of the Bermon *et al.* patent in general. The method described in the Bermon *et al.* patent is intended to maximize efficiency in a manufacturing process by identifying optimally and sub-optimally performing tools within common tool sets. "The method reliably determines precisely what are the gating tools among sets of parallel, unrelated tools in a complex manufacturing environment in which different tools can perform the same or similar sets of operations, generally at different rates." Abstract (emphasis added).

Second, Applicants respectfully assert that the Office is misinterpreting the portion of the Bermon *et al.* patent cited as teaching a "means for determining a technology capacity of the fabricator based on at least one technology unique tool set." The passage cited by the Office reads, in part: "Depending on the manufacturing environment and life cycles of the products and tools, there may be as many as five or more different tools that can perform a given process step, each with its own distinct operating characteristics." Column 1, lines 26-29 (emphasis added). Applicants assert that this passage clearly describes a common tool set rather than the unique tool set recited in claims 8 and 17.

Third, Applicants are confused as to what portion of the Bermon *et al.* patent the Office is referring to as teaching a "means for determining the capacity of at least one key shared tool set based on processes required by the wafer start loading." The Office cites "What-Ifs – Col 3."

However, the only portion of column 3 containing the term "what-if" (lines 10-14) describes the organization of file sets. Applicants assume, therefore, that the Office is referring to lines 18-24 of column 3, which read (emphasis added):

> The implementation also includes a module, that using the capability described in the invention of being able to identify truly gating tool groups among parallel, unrelated tool groups, selects those tool groups for incrementing, producing a new optimal solution for product mix and volume that represents the most efficient way of increasing manufacturing line output for the least number of additional tools.

As above, Applicants assert that this passage refers not to key shared tool sets, but to common tool sets. Accordingly, for each of the reasons above, Applicants respectfully request withdrawal of the rejection of claims 8 and 17.

In the Office Action, claim 9 is rejected under 35 U.S.C. § 103(a) over the Bermon *et al.* patent in view of the Occhino reference. Specifically, the Office asserts that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to use the capacity consumption calculations of Occhino in the capacity analyzation system of Bermon because using a correct tool utilization value will result in a more accurate capacity outcome." Office Action at 5. This rejection is respectfully traversed.

First, as shown above, the Occhino reference does not describe a capacity consumption calculation. Rather, the Occhino reference describes calculations for tool need and the maximum capacity of a particular tool set.

Second, as shown above, the Bermon *et al.* patent does not describe analysis of the capacity of a key shared tool set. Rather, the Bermon *et al.* patent describes a "method [that] reliably determines precisely what are the gating tools among sets of parallel, unrelated tools in a complex manufacturing environment in which different tools can perform the same or similar sets of operations, generally at different rates." Abstract (emphasis added). As shown above, the

method of the Bermon *et al.* patent is used to optimize common tool sets, rather than key shared tool sets. Accordingly, for each of the reasons above, Applicants respectfully request withdrawal of the rejection of claim 9.

Applicant appreciates the indication that claim 7 is allowed. Applicant also appreciates the indication that claims 4-6, 10-12, and 14-16 would be allowable if placed in independent form. However, for the reasons stated above, Applicant does not believe that further revisions are necessary, other than as provided herein. Nor does Applicant acquiesce in the correctness of the Office's assertion that the stated reasons for allowance or allowability of claims 4-7, 10-12, and 14-16 are the only bases for the allowance or allowability of these claims.

In view of the foregoing, Applicant respectfully requests withdrawal of the rejections, and allowance of the application. Should the Examiner require anything further from Applicant, the Examiner is invited to contact Applicant's undersigned representative at the number listed below.

Respectfully submitted,

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